

Properties of Linear Equations

In math, a line is something you might draw with a ruler, except that it extends infinitely in both directions. It contains an infinite amount of points.

If you have two points, you can find the slope of the line joining the points and then the equation of the line joining the two points. For unknown reasons, m stands for slope. The formula for slope is:

$$m = \frac{y_2 - y_1}{x_2 - x_1} \text{ for some points } (x_1, y_1) \text{ and } (x_2, y_2)$$

If the slope of a line is positive, then the line goes up as it goes from left to right. If the slope of a line is negative, then the line goes down as it goes from left to right.

There are 3 common forms of a linear equation (the 4th is not so common)

Form	Equation	What is needed to find equation
Standard Form*	$Ax + By = C$	Generally derived from a different form of a line
Point-Slope Form	$y - y_1 = m(x - x_1)$	A point (x_1, y_1) and the slope, m
Slope-Intercept Form	$y = mx + b$	Derived from another form or the slope, m , and the y-intercept, which is b
Intercept Form	$\frac{x}{a} + \frac{y}{b} = 1$	The x-intercept, a , and the y-intercept, b

*For standard form, the following must be true:

- A, B, C have a greatest common factor of 1
- A is NOT negative
- A and B cannot both be zero (but one can)
- A, B, and C are integers (no fractions or decimals)

A horizontal line has a slope of 0, and is just in the form $y=c$ for a constant c . There is no x term.

For a vertical line, the slope is undefined and is of the form $x=c$ for a constant c . There is no y term.

If you have a vertical line, then when you find the slope, $x_2 - x_1$ will be 0 and since you cannot divide by 0, the slope is undefined.

To find the intercepts of a line, the x-intercept is the point where $y=0$ and the y-intercept is the point where $x=0$.

Two lines are parallel if and only if their slopes are the same.

Two lines are perpendicular if their slopes are negative reciprocals of each other. That means the product of the two slopes must be -1 . A line with a slope of 0 is perpendicular to a line with an undefined slope.